ASTRA MACHINERY PLANT AB • ANNO 1929

HEATING BOILERS

Astra G-18 E

Astra G-25 E

Astra G-32 E

Astra G-40 E

INSTALLATION AND OPERATION MANUAL

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This user manual was compiled following the requirements of EN 12171 "Heating systems in buildings. Procedure for the preparation of documents for operation, maintenance and use. Heating systems not requiring a trained operator".

1. SAFETY REQUIREMENTS

1.1. The room where the boiler is to be installed should be ventilated.

1.2. Free inflow of air into the room should be ensured.

1.3. The boiler flue connection with the chimney should be tight. Do not heat up the boiler with leaking flue connections!

1.4. The boiler should be installed in a closed heating system with a closed (membranous) expansion vessel, the volume of which should be no less than 10% of the total volume of the heating system (including the boiler) (the volume of the expansion vessel can be calculated according to the standard EN 12828 annex D).

1.5. A safety valve for no more than 2 bar response pressure should be fitted onto the boiler in the heating system for the boilers Astra G-18E, Astra G-25E, Astra G-32E, and a maximal response pressure of 3 bar for the boiler Astra G-40E (please see Chapter 5, "Requirements for connection of the boiler to the heating system").

1.6. Remove the accumulated soot and resin from the boiler flues, as instructed in this manual.

1.7. The room where the boiler is installed should have fire-extinguishing tools: fire extinguishers, sand box, shovel and other tools.

1.8. Do not place flammable materials on or near the boiler.

1.9. Connect the boiler to the electric system only via a three-pole plug plugged into an adequate three-pole socket with earthing. Protect connection cable from damages.

1.10. Observe operation of temperature control devices and gauge readings when operating the boiler. In case of faulty operation of the boiler, stop operation and remove the fault.

1.11. Kindle the boiler and put the firewood into the boiler only as indicated in Chapter 7 of this manual.

1.12. Keep children away from the boiler! The boiler can be serviced only by adults.

1.13. Before kindling the boiler, check if the heating system is filled with water and deaerated.

1.14. The operating pressure in the heating system should not exceed the following:

- 2 bar – for boilers Astra G-18E, Astra G-25E, Astra G-32E;
- 3 bar – for boiler Astra G- 40E.

1.15. The electrical connections are factory tested and the following parameters were confirmed:

- integrity of the protective circuit – electrical resistance of the protective circuit does not exceed 0.1Ω;
- resistance of the electrical insulation – at least 1.0 MΩ;
- resistance of electrical insulation was checked at 50 Hz, 1 000 V voltage.

2. TECHNICAL DESCRIPTION

• GENERAL VIEW OF THE BOILER

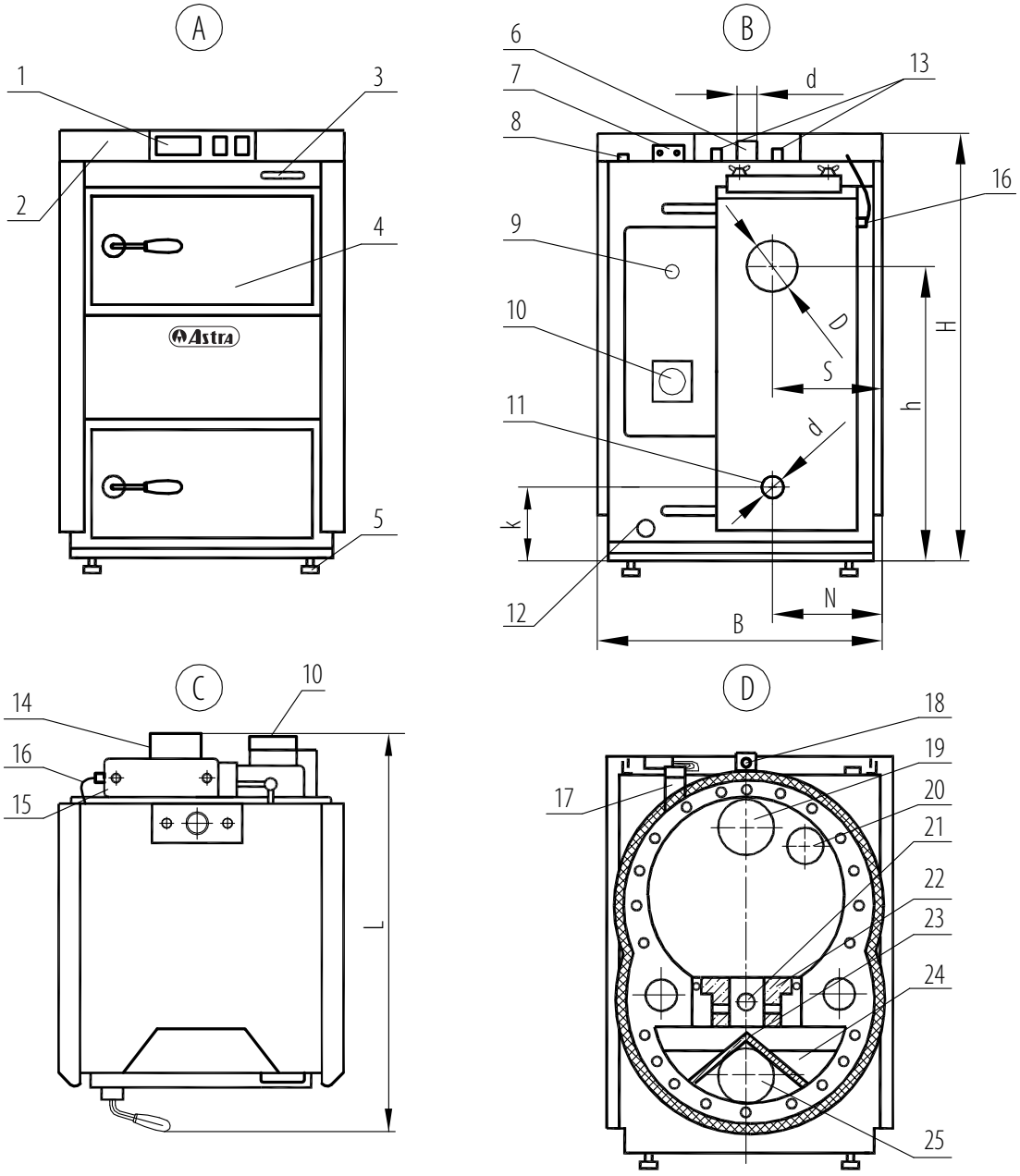


Fig. 1 General view of the boiler

A – front view; B – rear view; C – top view; D - section.

1. Front control panel; 2. Rooftop cover; 3. Handle of the upper flue damper; 4. Door of the fuel chamber; 5. Adjustable support legs; 6. Flow water pipe; 7. Rear control panel; 8. Sensor immersion pocket ½" of the safety temperature limiter 95°C valve; 9. Primary air regulation damper; 10. Ventilator; 11. Return water pipe; 12. Water drain nipple; 13. Connections of the cooling serpentine; 14. Flue pipe; 15. Flue cleaning cap; 16. Smoke temperature sensor; 17. Safety ventilator shutdown 95°C thermostat sensor; 18. Water temperature sensor; 19. Upper combustion chamber opening to the flue; 20. Primary air inlet opening; 21. Secondary air inlet opening; 22. Ceramic burner; 23. Ceramic chopper; 24. Ceramic segment; 25. Opening to the flue

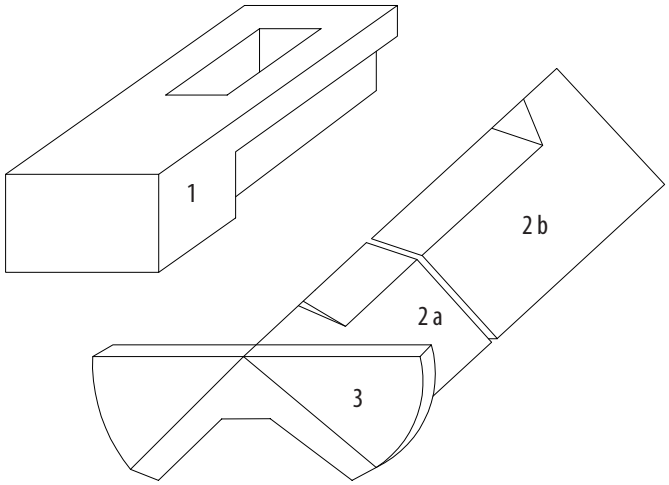
Astra G boiler model	B	L	H	h	k	D	d	N	S
Astra G-18E	646	750	1156	130	130	152	G1 1/2"	205	215
Astra G-25E	646	965	1156	130	130	152	G1 1/2"	205	215
Astra G-32E	646	965	1246	1025	130	152	G1 1/2"	205	215
Astra G-40E	660	975	1176	935	210	152	G1 1/2"	160	160

• TECHNICAL DATA OF THE BOILER

Name of indicator		Indicator value			
		Astra G-18E	Astra G-25E	Astra G-32E	Astra G-40E
Nominal heat output	firewood, kW	18	25	32	40
	wooden briquettes, kW	20	28	33	42
Class of boiler according to EN 303-5		3	3	3	3
Class of protection against electric impact		1	1	1	1
Efficiency rate,%		81-89	81-89	81-89	81-89
Power of emergency cooling system, kW		12	15	15	18
Water volume in the boiler, l		52	62	71	85
Setting range of the temperature regulator, ℃		65-85	65-85	65-85	65-85
Maximum operating draught in the flue, mbar		0.25	0.30	0.30	0.30
Working pressure of water in the system, bar, max.		2.0	2.0	2.0	3.0
Testing pressure of the boiler, bar		3.0	3.0	3.0	4.5
Max. allowable water temperature in the boiler, ℃		108	108	108	108
Max. allowable operating water temperature in the boiler, ℃		95	95	95	95
Electric characteristics:	voltage, V / frequency, Hz	220/50	220/50	220/50	220/50
	average power used, W	40	50	58	80
Level of electric protection of the boiler		IP30	IP30	IP30	IP30
Dimensions:	height, mm	1156	1156	1246	1176
	width, mm	646	646	646	660
	depth, mm	750	965	965	1176
Weight of boiler, kg,		260	310	330	380
Threaded connection diameter		1½″	1½″	1½″	1½″
Volume of fuel chamber, l		67	105	130	140
Dimensions of the loading aperture, mm		350x285	350x285	350x285	350x285
Flue gas duct diameter, mm		152	152	152	152
Length of wood pieces, mm		330	500	500	550
Average temperature of the flue gases at the nominal heat output, ℃		165	188	195	205
Exhaust gases volume at the nominal heating capacity, m^3/h		70	90	90	106-160
Resistance of the water tract, at temperature difference of 10℃, mbar		6	9	8.5	13.8

• CERAMIC ELEMENTS OF THE BOILER

The boiler has ceramic elements of three types: ceramic burner 1, ceramic chopper 2 and two ceramic segments 3 (Fig. 2). The chopper 2 must be moved to the back wall of the boiler chamber during operation of the boiler, segments 3 – resting upon the front edge of the chopper. If needed, the ceramic burner 1 can be removed. For this purpose, use a screwdriver to remove the sealing rope from between the ceramic burner and the frame of the boiler, then this ceramic insert can be removed.



Ceramic element	Boiler type			
	G-18E	G-25E	G-32E	G-40E
1. Burner				
G-18.00.003	1			
K-30.00.007		1	1	
ŠK-50.07.001				1
2. Chopper				
G-32.01	1	1	1	
G-32.02		1	1	2
3. Segments				
G-18.00.004	2	2	2	
G-18.00.004-01				2

Fig.2 Ceramic inserts and their positions
1. Ceramic burner; 2. Ceramic chopper; 3. Ceramic segments.

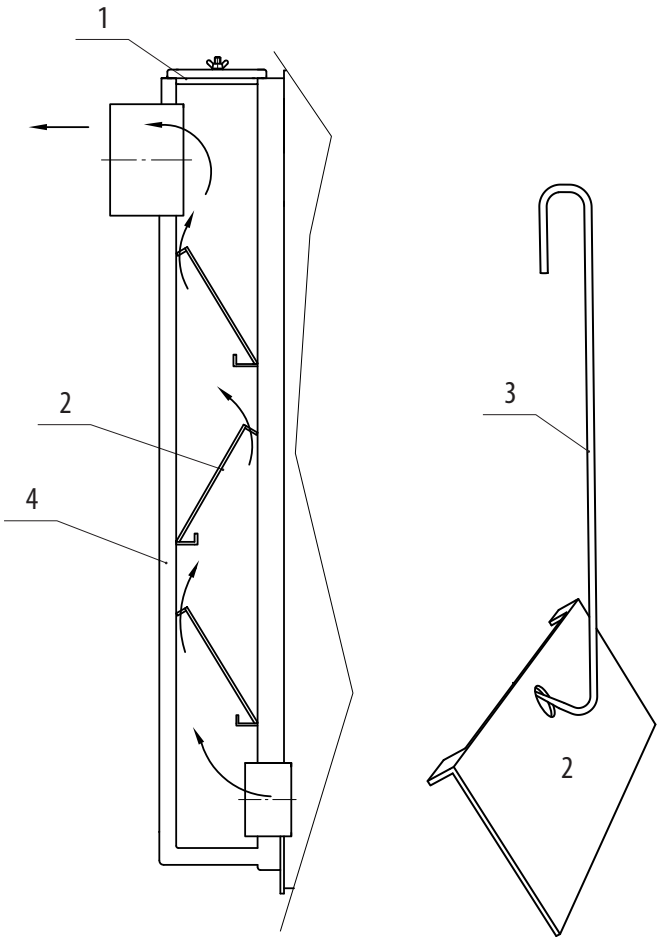


Fig. 3 Turbulence plate technology
1. Inspection aperture; 2. Turbulence plates; 3. Poker;
4. Heat exchanger of the boiler flue.

• TURBULENCE PLATES

Turbulence plates – a technology invented and patented by "Astra" engineers, used for capturing more heat from the hot exhaust smoke. It forces the exhaust smoke to hold, become turbulent and thus transfer more heat to the adjacent heat exchanger. The core of the device consists of the turbulence plates, positioned at an angle in the rectangular-shaped flue channel of the boiler. The inspection aperture 1 is installed on the top part of the flue channel (Fig. 3), covered with a screw-on cover with a gasket. This aperture is used for cleaning the flue channel and placing/removing the turbulence plates. The turbulence plates 2, shown in Fig. 3, maintain their position in the flue due to their force of gravity alone. They are inserted into the flue channel or removed using a poker 3, which is provided with the boiler. Poker 3 (Fig. 3) is bent at an angle of approximately 80° to the handle, so that the hooked plate does not slide off. In order to be able to hook the turbulence plate 2 with a poker, a hole has been made in its upper part for hooking with a poker. The plate rests upon the heat exchanger 4 of the boiler flue on four supports: two bottom and two upper supports. When inserting the plate 2 with a poker 3 into the flue channel, first the lower position is found, and after slightly loosening the poker, yet without removing it from the hole, the plate is allowed to descent onto the opposite side of the heat exchanger due to the force of gravity until it touches the wall of the heat exchanger with

its upper supports. Then the tool can be removed and the next plate can be installed in a similar way.

Turbulence plates decrease the temperature of the exhaust smoke. The boiler can be operated without the plates, but then greater losses of heat through the chimney will occur.

3. INTENDED USE

The heating boiler is designed for the heating of residential and public buildings, manufacturing shops and other buildings where a closed heating system has been installed. Control and regulation devices are installed in the boiler, which automatically maintain the set water temperature, ensure economically efficient usage of the boiler and safe operation.

Boilers of this type are designed to burn wood, partially generating gases. Gas is extricated (generated) from the burning firewood in the upper combustion chamber of the boiler and burned in the lower chamber. The intensity of gas generation and combustion is regulated by the frequency and duration of air inflow into the combustion chambers.

Advantages of the boiler are the following:

- gas generating combustion ensures effective burning of wood and a high efficiency coefficient since the burning process takes place at a high temperature of 900°C;
- the heat output of the boiler can be regulated within the range of 40-100%. The boiler is automatically controlled using an electronic regulator, by switching the ventilator inflowing into the combustion chambers off or on, or by regulating the speed of its rotation;
- the combustion period of one fuel load is long due to the large volume of the fuel chamber;
- complete fuel combustion ensures cost-efficient fuel usage;
- the turbulence plates installed in the flue of the boiler enhance heat exchange in the boiler and reduce the temperature of the smoke in the chimney;
- it is sufficient to remove the ashes 1-2 times per week.

4. TRANSPORTATION, STORAGE, UNPACKING

The heating boiler is to be transported and packaged in accordance with the documentation of the manufacturer, protected from precipitation and dust. It can be transported only in vertical position, fastened to avoid sliding and falling. If the boiler is transported in other than vertical position, decorative surfaces may be damaged, cladding battered, control and regulation equipment broken, built-in ceramic inserts may fall down and splinter. The heating boiler should be carefully loaded, unloaded and transported, without any significant impact.

The boiler should also be stored in a vertical position. It is not allowed to put one boiler on top of another, as a packaging frame is not designed for this purpose. The boiler should be stored in a closed room protected from precipitation. The air humidity of the room should not exceed 80%, in order to avoid condensate forming on the surfaces of the boiler. Storage temperature may vary from -40°C to +60°C.

If the boiler was transported or stored in minus temperatures, then before it is kindled, it should be kept in plus temperature for no less than 2 hours.

After the heating boiler is delivered to the site, take off the packing frame and polyethylene film, unscrew boiler bolts and, fastening to the packaging base, remove the boiler from the packaging base.

Open the doors of the boiler and check if all elements listed in a delivery kit are included.

The delivery kit consists of the following: boiler - 1 pc.; poker - 1 pc.; scraper - 1 pc.; ventilator - 1 pc.; operation manual - 1 pc.; support legs - 4 pcs.

Check if painted surfaces have not been damaged during transportation, if the components are not bent and if control and regulation equipment is intact. In case you notice any inadequacies, present your claims to the vendor company.

5. INSTALLATION

• ACCUMULATION TANK

These solid fuel boilers are intended to be fully loaded during the operation; the most efficient mode of their exploitation is at the nominal or maximum heat output. It is advisable to install an accumulation tank of sufficient size in their proximity, which could accumulate the excessive heat. If the boiler is operated without the accumulation tank, its lifetime can be shortened because, in such a case, a relatively low temperature of the outflowing water is maintained in the boiler (65-70°C). Therefore, the temperature of the water returning to the boiler from the heating system is as low as 55-60°C. More water vapour condenses in the boiler at such operating temperatures, more tar accumulates on the internal walls of the boiler and metal corrosion intensifies. When operating the boiler with an accumulation tank, it is possible and advisable to maintain constantly maximum temperature of outflowing and returning water, respectively 85°C and 72°C, then condensation of water vapour and metal corrosion will be significantly lower. Recommended capacity of the accumulation tank is approximately 50 litres per 1 kW of nominal power of boiler:

Boiler model	**Astra G-18E**	**Astra G-25E**	**Astra G-32E**	**Astra G-40E**
Required volume of the accumulation tank, litres	900	1200	1500	2000

The boiler is to be operated only with an emergency cooling system installed!

• DESCRIPTION OF THE EMERGENCY COOLING SYSTEM DIAGRAM

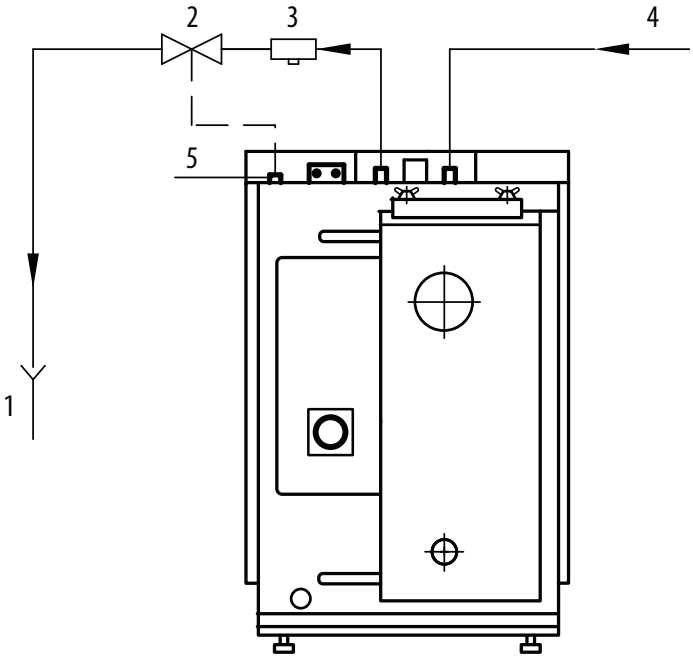


Fig. 4 Connection diagram of the emergency cooling system
1. To sewage; 2. Thermostatic safety temperature limiter 95°C valve; 3. Filter; 4. Water from public water supply, pressure 2-6 bar, temperature 12°C; 5. Sensor of the thermostatic safety temperature limiter 95°C valve.

A thermostatic safety temperature limiter 95°C valve (Fig. 4) protects the boiler form the overheating. If the water temperature in the boiler exceeds 95°C, the valve automatically opens the flow of cold water from the public water supply network through the cooling serpentine, where it absorbs the excessive heat energy and flows out into the sewage. The sensor of the valve with the external thread ½" is screwed onto the socket on the rear wall of the boiler.

Technical data of the thermostatic safety valve are the following: Opening temperature - 95°C; Maximum operating temperature- 110°C; Operating pressure - 10 bar; Bulb of the sensor - L=142 mm, external thread ½".

The emergency cooling system protecting the boiler from overheating cannot be used for heating domestic water.

• DESCRIPTION OF THE HOUSE HEATING SYSTEM SCHEME

The house heating system with an accumulation tank could be divided functionally into two circles: heat production and heat consumption. Both circles operate independently and interact in the accumulation tank. The heat production circle consists of a boiler, Laddomat 21 thermostatic mixing unit with a circulation pump installed in it, expansion vessel, fittings and accumulation tank. The intended use of this circle is to charge the accumulation tank only. To charge the tank, the boiler could operate on its maximum heat output and outflowing water temperature 85°C. That mode of boiler operation is optimal for the boiler and combustion process itself.

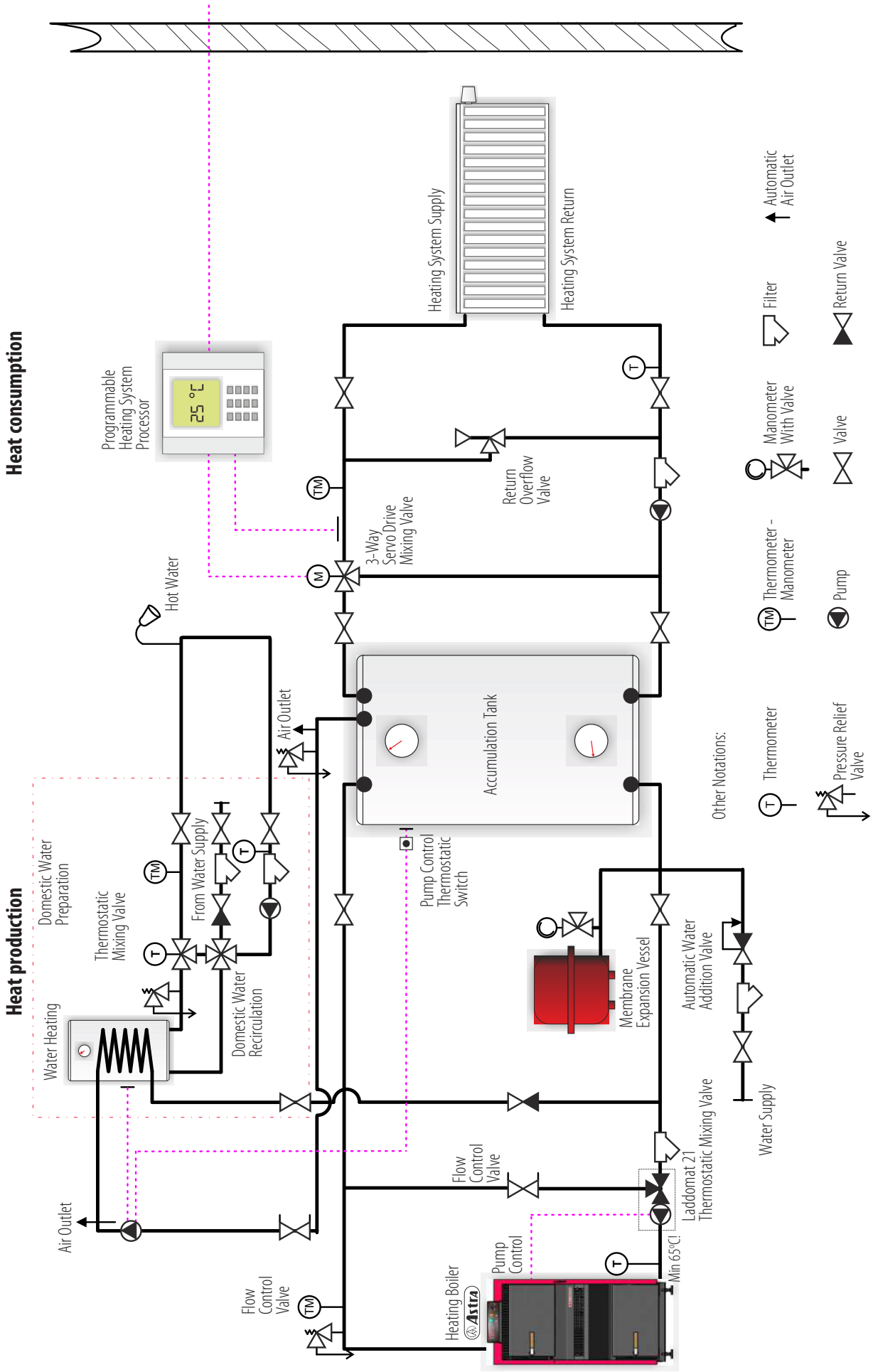


Fig. 5 Principle scheme of the house heating system including heat accumulation

The heat consumption circle uses the heat accumulated in the tank. The circle consists of a room thermostat or a programmed control processor, room or/and outside temperature sensors, 3-way servo drive, mixing valve, underfloor heating system, radiators, piping, fittings. The programmed processor controls a 3-way mixing valve, which allows more or less heat (45-60° C) into the radiators, according to demand. This way of heat consumption allows the heating of the house as long as the tank stores heat independently from the boiler.

• REQUIREMENTS FOR CONNECTION OF THE BOILER TO THE HEATING SYSTEM

The following requirements should be fulfilled when installing the boiler:

- The boiler should be installed in a closed heating system with a closed membranous expansion vessel, the volume of which should be no less than 10% of the total volume of the system. A closed heating system is a kind of system with no free access to atmospheric air, which actuates corrosion. Due to this, drainage of water from the system without an important reason is undesirable, e. g. in summer. It is also necessary to ensure watertightness of the system in order to need fewer refills with fresh water containing free oxygen. The quantity of the additional water let in should not exceed 5% of the system water volume per year;
- The boiler is connected to the heating system through connection pipes 6 – water supplied to the heating system and 11 – water returning from the heating system (Fig. 1);
- Internal threads G 1½" of pipes 6 and 11 ;
- There is a nipple 12 for water filling or draining from the boiler (Fig. 1);
- Internal thread G ½" of the nipple 12;
- A pressure relief valve conforming to norm EN1268-1 is to be installed in the heating system as close to the boiler as possible at a location easy to reach by hand;
- pressure relief valves and control devices must conform to the following technical characteristics:

Instrument	Technical characteristics	Type of boiler
Pressure relief valve	Connection diam. does not exceed ½", set opening pressure 2 bar	Astra G-18E, Astra G-25E , Astra G-32E
Pressure relief valve	Connection diam. does not exceed ¾", set opening pressure 3 bar	Astra G-40E
Thermometer-manometer	Range of temperature 0-120°C, pressure 0 – 4.0 bar	All boilers

There must be no ball valves installed between the boiler and the pressure relief valve.

• Water from the pressure relief valve should be conducted via an offtake pipe. It should be conducted in a way that will allow the water passing through the pressure relief valve to flow safely, avoiding exposure of people and electrical parts of the boiler. The diameter of the offtake pipe should be no less than the diameter of the offtake opening connection nipple of the safety valve. The total length of the offtake pipe should not exceed 2 m. No more than 2 elbow joints at angles of 90° are to be used when installing this duct. No ball, mixing or other valves are to be installed in the water offtake pipe. This offtake pipe is to be installed in a way that will make the flow of the passing water visible. If part of the pipe installed is hidden, e. g., in a sewerage pipe, then such a pipe should have a special funnel enabling visual observation of the offtake flow of water.

Operation of the pressure relief valve is to be checked at least once a month. The valve is opened for a short period of time, by turning its head, to reveal a small amount of the offtake water. If this is not done periodically, the parts of the valve can stick together due to high temperature and fail to open, when required. In case the safety valve fails to open in an emergency situation, serious damage to the boiler and the heating system can occur as well as hazard to the health and life of people.

In order to guarantee natural water circulation of water in the boiler, the pipework between the boiler and the mixing valve in the line boiler–mixing valve–boiler is to be of the same diameter and correspond to the diameter of the connection pipes of the boiler.

• CIRCUIT DIAGRAM OF THE BOILER

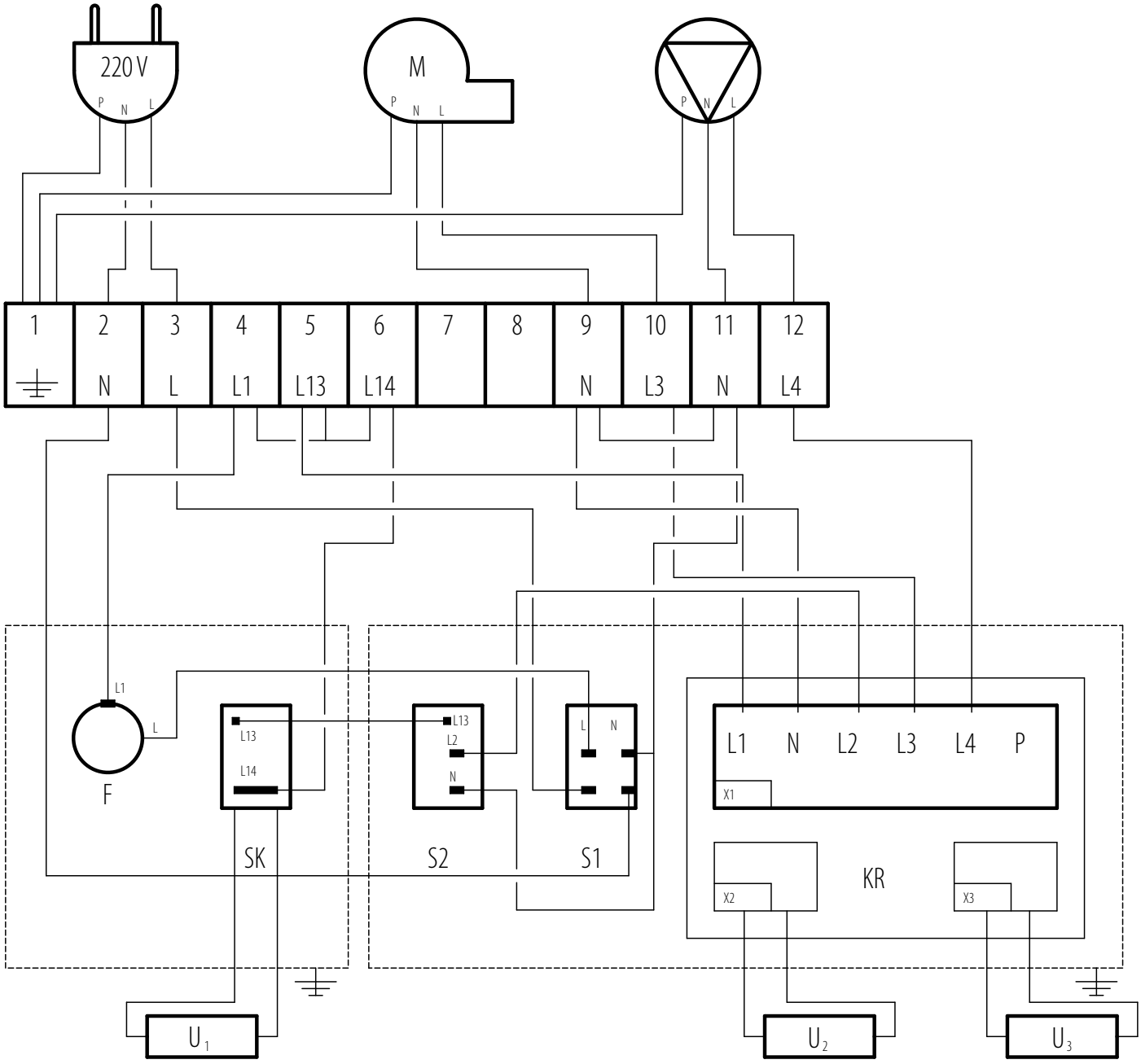


Fig. 6 Circuit diagram of the boiler

S1 - power supply switch; S2 – ventilator switch; SK – emergency ventilator shutdown 95°C thermostat; F - fuse; M - ventilator; ⌀ - circulation pump of the heating system; KR – electronic controller; $U_{1,2}$ - water temperature sensors; U_3 - smoke temperature sensor.

- An electric installation with earthing, in accordance with the electric safety regulations in force, is to be installed when connecting the electric part of the boiler.

Protect the isolation of the mains cable against damage.

• CONNECTION OF THE CIRCULATION PUMP

In order to insure a continuous flow of water, a circulation pump is to be installed in the system, on the return water pipe behind the mixing valve. The electronic controller of the boiler controls the pump. Before connecting the circulation pump, remove the rooftop cover of the boiler (Fig. 7). The cover is removed in the following sequence: 1) unscrew two fastening bolts, 2) lift the backside part of the cover, 3) push the cover forward and then lift it up. Connect the wire of the circulation pump to the 12-way electric terminal connector, contacts No 11 and 12, marked with the sign ► (See Fig. 6 "Circuit diagram of the boiler"). Connect the earthing wire of the pump to the contact No. 1 on the same connector.

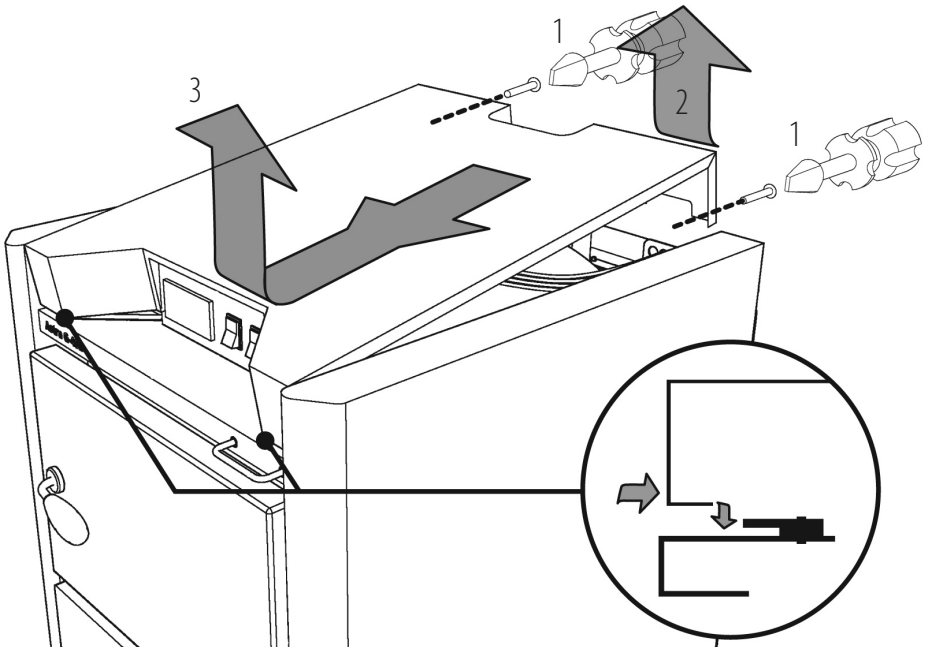


Fig. 7 Removing the rooftop cover of the boiler
1. Unscrew bolts; 2. Lift the backside of the cover; 3. Push the cover forward , then raise.

• CONNECTION OF THE VENTILATOR

The boiler is transported with the ventilator removed and put into the upper chamber of the boiler (Astra G-18E, Astra G-25E, Astra G-32E) or fastened using adhesive tape to the top of the packaging frame of the boiler (Astra G-40E).

For boilers Astra G-18E, Astra G-25E, Astra G-32E: unpack the ventilator and release the clamp on the nipple at the ventilator installation bed 10 (Fig. 1). Put the opening of the ventilator onto the nipple, slip a clamp on top and tighten it. Check if a ventilator case sits tightly. Connect the wires of the ventilator cable lead through a hole in the rooftop cover of the boiler to the terminals of the ventilator. For boilers Astra G-40E: unpack the ventilator, screw its case on at the ventilator installation bed 10 (Fig. 1) using the existing bolts and check the stiffness of the connection. The ventilator cable has already been connected during fabrication.

• CONTROLLING THE TEMPERATURE OF WATER RETURNING TO THE BOILER

It is absolutely necessary to maintain the temperature of the water returning from the heating system to the boiler at a constant level, no less than 65°C, as this will prolong the lifetime of the boiler and will make the combustion process more effective. This is because when a constant high temperature of water returning to the boiler is maintained, there arises significantly less water vapour condensation inside the boiler. The heavy water condensation is harmful to the boiler, because deposits of tar, pitch and soot accumulate on the walls of the heat exchanger, causing intense metal corrosion. Moreover, the resulting layer of soot impedes effective heat transfer and the efficiency of the boiler falls.

In order to maintain the temperature, we recommend installing the small circulation circle together with a Swedish-made thermoregulation device, "Laddomat 21-60". Make sure that the "Laddomat" is supplied with the 78°C or 72°C thermostat cartridge. The mentioned temperature is the one at which the valve of the device opens completely. However, the actual temperature of the water returning from the system and getting into the boiler after mixing, is 5-6°C lower. The higher the temperature of the return water is, the better it is for the boiler. Thermoregulation devices of other manufacturers could be used for maintaining the temperature of the returning water as well.

• HEATING OUTPUT, WATER TEMPERATURE AND WATER FLOW RELATIONSHIP

The heating output supplied to a heating system depends directly upon the difference of flow and return water temperatures

Δt and the intensity of the water flow circulating through the boiler. The boiler will fail to reach the desired temperature of the flow water if the returning water temperature is too cold or the circulation pump is too powerful. This will happen because the boiler will be forced to produce a larger heating output than it has been designed for. The most effective boiler operation occurs when the difference between the flow and return water temperatures is 12-14°C. If the boiler is forced to operate with a 20°C or even greater temperature difference, it will work ineffectively, consume too much of fuel, and the combustion period of one fuel load will consequently shorten. If the previously mentioned difference of temperatures is kept less than 10°C, the fuel in the boiler will again burn inefficiently and fume because of a lack of air supply. If you know the water flow intensity near your boiler, in the above presented table you can check, what the difference of flow and return temperatures your boiler is capable to maintain, when operating at the nominal heating output.

Difference of water temperatures Δt, °C	Heating output, kW			
	18	25	32	40
	Water flow, l/min			
11	24	33	43	53
12	22	31	39	49
13	20	28	36	45
14	19	26	33	42
15	18	24	31	39
16	16	23	29	37
17	16	22	28	34
18	15	20	26	33

Do not forget to keep the returning water temperature as high as possible, at least 65°C or even higher! It is necessary to assure that a thermometer is installed on the returning water pipe, in order to be able to observe this temperature at any time!

• INSTALLATION OF THE BOILER ROOM

The boiler room should be ventilated. The required air inflow necessary for combustion should be also ensured. For this purpose, boiler room doors should have ventilation grating or there should be a sufficient gap between the doors and the floor. If there is no possibility to supply air in from another rooms or the house is very tight, it will be necessary to install an opening in the exterior wall. The cross-section area of the opening should be at least 0.001 m2/kW.

Place the boiler as close to the flue as possible on a hard concrete levelled basement. Leave at least 600 mm gap between the backside casing of the boiler and the room wall for boiler servicing and cleaning. The smallest distance between a lateral casing of the boiler and a building structure is 400 mm. If the building structure is made of flammable materials, this distance should be doubled. A freely approachable space of at least 800 mm should be then left from the opposite side of the boiler to ensure access to the backside of the boiler, for its servicing and cleaning. The floor under the boiler, within the distance of 50 cm in front of it and within the distance of 30 cm around the boiler should be made of inflammable materials. Screw supporting legs onto the base of the boiler and level the boiler with screw nuts using a level; then connect the heating system circulation pump to the boiler.

The smoke exhaust pipe of the boiler should be connected to the chimney through a metal duct. The internal diameter of the metal connecting duct should be at least the same as the external diameter of the smoke exhaust pipe of the boiler. To improve the draught, the connecting duct between the boiler and the chimney should be installed at an inclination towards the boiler. All junctions should be carefully tightened using a heat-resistant material and insulated using thermal insulation.

If an additional damper is installed between the boiler and the chimney for the draught control purpose, the damper should not close more than 2/3 of the cross-section area of the opening in its fully closed position.

• REQUIREMENTS FOR THE CHIMNEY

It is recommended to insert acid-resistant stainless steel liner, if the chimney is made from masonry. It improves draught of the chimney and protects the masonry from destruction due to the impact of condensate. Internal diameter of the liner should

be no less than the external diameter of the smoke exhaust pipe of the boiler. The chimney liner can be round or oval. It is not recommended to use rectangular-shaped liner as, due to the temperature fluctuations, its walls deform, gaps appear at the element junction points, through which the condensate falls on the walls of the bricks chimney. Additional air is sucked in, which reduces draught of the chimney. Draught for each boiler model should correspond to the referred value of draught in the table "Technical data". The liner should be factory made. Minimum permissible height of the chimney should be at least 6m. The top of the chimney should be above the ridge at least by 0.5m. If the chimney is further from the ridge than 1m, the angle horizon-the ridge- the cap of the chimney should consist 10° or less degrees. Draught of the chimney can also be negatively affected by various obstructions near the building: trees, hills, other buildings. Fig. 8 presents the recommended minimal angles between the chimney, nearby objects and the horizon. Angles larger than those indicated will cause reduction of draught of the chimney.

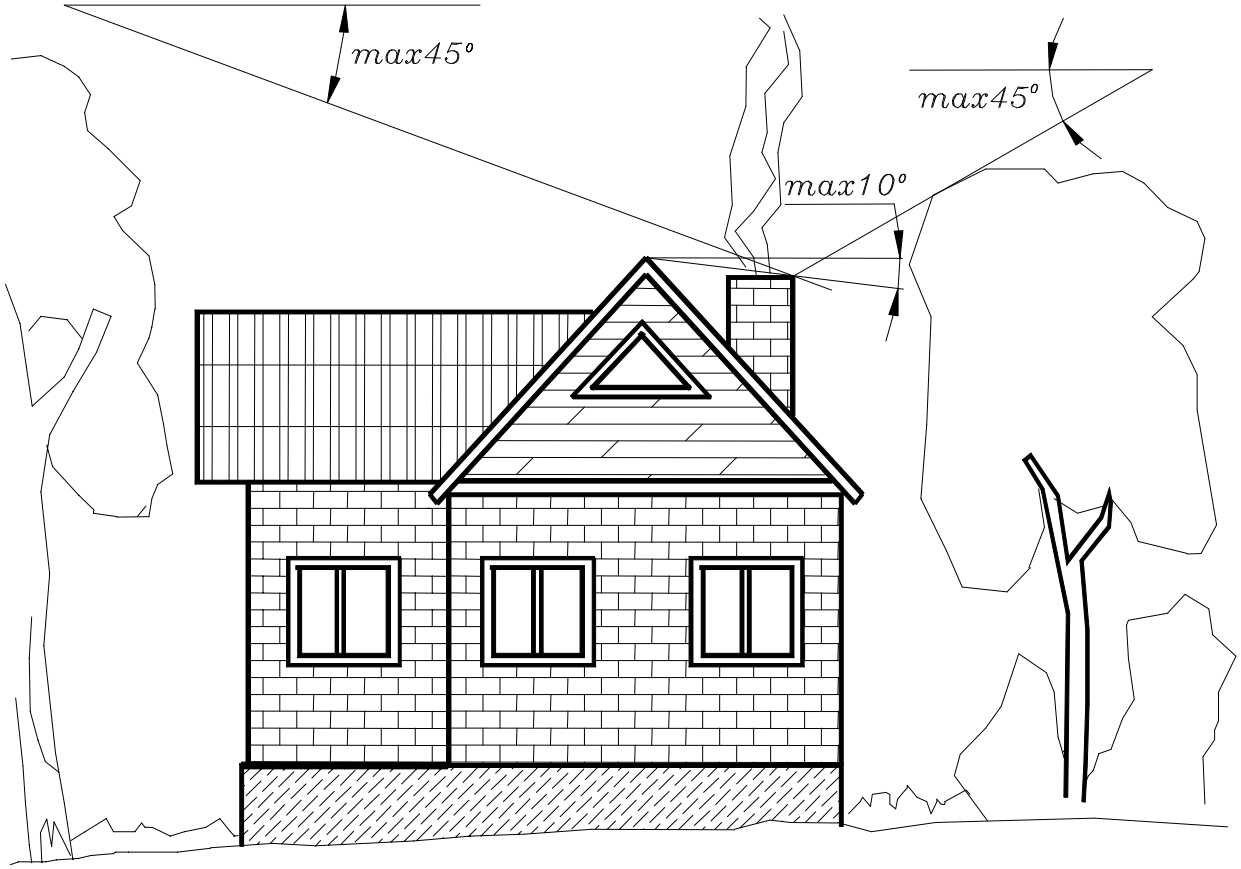


Fig. 8 Positioning of a chimney in respect to vicinity objects

The connection of other devices to the chimney to which the boiler is connected is prohibited.

The chimney should be cleaned at least once a year!

6. FUEL

The boiler is fired only by wood logs and wood briquettes. It is possible to fire it with fuel peat briquettes, however the operation of the boiler becomes less comfortable for the user as it is necessary to remove the ashes of these highly ash-producing briquettes after each loading. The ceramic elements of the lower chamber can be damaged if they are removed every day when cleaning, thus their lifetime will be shorter. Therefore, we recommend usage of fuel peat briquettes only in rare, exceptional cases.

It is recommended to fire dry firewood with a moisture content of 12-20 %. The drier the firewood, the larger its calorific capacity.

When the moisture content of the firewood is 20%, the heat potential of 1 kg is approximately 4 kWh; when the moisture content is 50%, its heat potential is reduced by half.

The length of the firewood should be at least 5cm shorter than the length of the boiler combustion chamber.

Type of boiler	Astra G-18E	Astra G-25E	Astra G-32E	Astra G-40E
Length of firewood, mm	310	500	500	550

The recommended thickness of the wood logs is 100-150mm. Thicker pieces of firewood should be split at least once. Up to 15% of the fuel load can consist of fine wooden splinters and sawdust. However, they must be loaded in such a way so as not to block the opening of the ceramic burner 22 (Fig. 1) connecting the upper and lower chambers of the boiler.

Do not fire freshly prepared and excessively damp pieces of firewood. The operation of the boiler becomes inefficient, deposits of resin emerge on its inside walls as well as excessive condensate. Corrosion of the boiler takes place several times faster when firing it with freshly prepared wood or wood that has been dried outside for several months only!

Recommendations for firewood preparation:

- put split wood in a properly-ventilated place – if possible, in a sunlit place;
- firewood should be well sheltered from rain and snow;
- pieces of split wood should be stacked with sufficient gaps between them so that the freely-circulating air can blow away the moisture evaporated from the pieces of firewood;
- there should be sufficient space above the heap of firewood below the roof and sufficient ventilation to remove the moist air;
- it is not advisable to store freshly-cut firewood in a basement since the firewood needs sun and free air movement to dry. Dry wood can be stored in the basement where sufficient ventilation is guaranteed;
- it is recommended to dry the split firewood outdoors under the above-mentioned conditions. Depending on the type of wood, soft wood (alder, asp, fir, poplar) must be dried for at least 8 months, and hard wood (oak, ash, birch) for at least 20 months.

Firing the boiler with coal, rubber or plastics is prohibited. However, loading wood briquettes into the boiler together with their plastic packaging bags is allowed.

7. OPERATION

• FRONT CONTROL PANEL

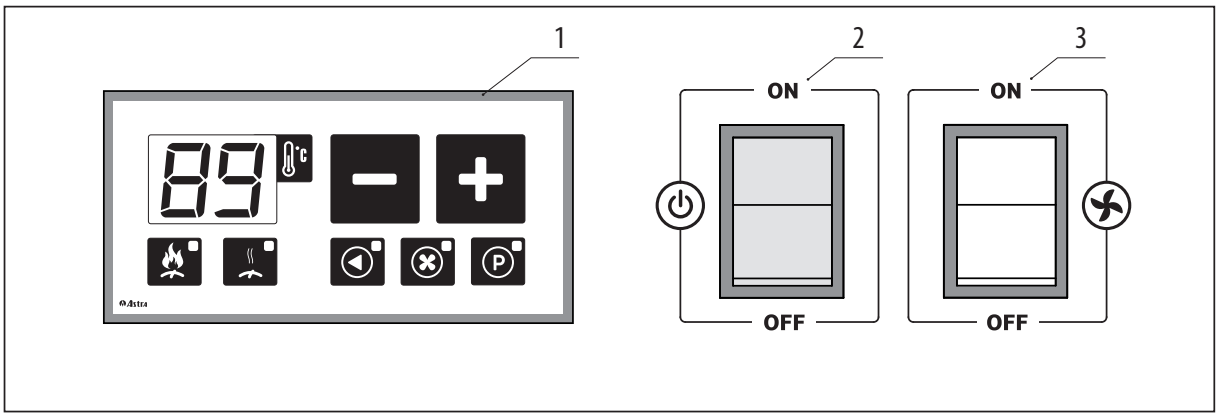


Fig. 9 Front control panel

1. Electronic boiler regulator; 2. Green button for switching the voltage of the boiler on and off; 3. Red button for switching on the ventilator.

The front control panel has an electronic boiler regulator 1, a green button for switching voltage to the boiler on/off 2 and a red button for switching on the ventilator 3. These buttons light up in the activated state. For more details on the operation of the front panel buttons, see “Electronic boiler regulator KR-4.3D” and “Boiler kindling procedure”.

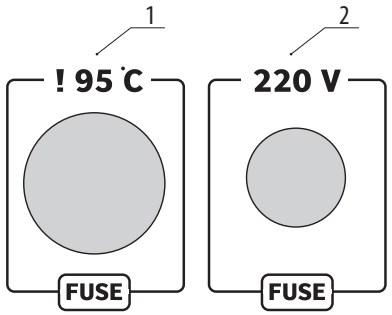


Fig. 10 Rear control panel
1. Thermal fuse ; 2. Electric fuse.

• REAR CONTROL PANEL

The following safety devices are installed in the rear control panel: thermal fuse 1 and electric fuse 2 (Fig. 10). The purpose of the thermal fuse, otherwise called the maximum boiler temperature emergency thermostat, is to switch off the boiler ventilator if water temperature in the boiler exceeds the maximum permissible 95°C due to unforeseen reasons. The temperature sensor of the thermostat is installed in a dedicated sleeve 16 (Fig. 1). The burning intensity decreases when the ventilator is switched off and the water temperature decreases. When the emergency thermostat trips, the lamp of the ventilator switch 3 on the front panel switches off (Fig. 9) and the lighting indicator bulb 4 "Firing off" on the electronic regulator lights up (Fig. 11). In this case, it is necessary to find out the causes of tripping and to remove them. After the boiler cools down, the emergency thermostat can be returned to its normal operating mode. For this purpose, unscrew its cover and depress the red button.

⚠ The cause of overheating of the boiler and tripping of the emergency thermostat must be found and removed. If this is not done, the risk of serious damage to boiler equipment as well as hazard to human health and life remains. If the user cannot locate and remove the cause of tripping of the emergency thermostat, a professional servicing company must be consulted!

The electric fuse is designated to protect the elements of the electric circuit in case the current in the mains exceeds 2 A. If the fuse is damaged, the boiler will not switch on and its indicator lamps will not light. In this case, remove and replace the fuse.

The rear control panel of the boiler is grounded.

• ELECTRONIC BOILER REGULATOR KR-4.3D

The electronic boiler regulator KR-4.3D is designed for controlling a solid fuel boiler. It controls the ventilator in accordance with the PID regulation law and the circulation pump of the system, by position "on-off". The regulator adjusts the rotation speed of the ventilator using the impulse method, thus intensifying or slowing down the burning process. The speed of the ventilator is defined in proportion to the actual temperature deviation from the set temperature, the duration of the deviation and the speed of temperature change of the boiler. The regulator reacts to the water temperature in the boiler and smoke temperature in the flue. A NTC-type sensor for measuring water temperature is installed in the special immersion pocket 18 (Fig. 1), the outer side of which is submerged in water inside the boiler. A PT-type sensor for measuring smoke temperature is installed in the special sleeve 16 (Fig. 1), which is located in the flue gases duct of the boiler.

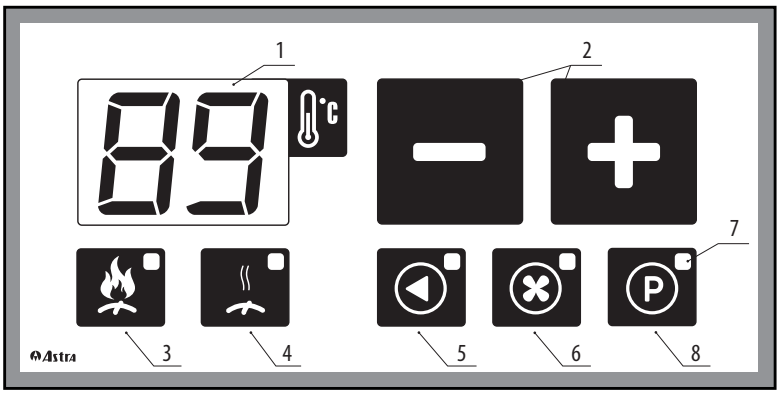


Fig. 11 Front panel of regulator KR-4.3D
1 - digital temperature indicator; 2 - temperature setting buttons; 3 - lamp "Firing on", 4 - lamp "Firing off", 5 - lamp "Pump on", 6 - lamp "Ventilator on", 7 - lamp "Programmable channel on", 8 - multifunction button.

The digital temperature indicator 1 (Fig. 11) indicates both the measured and the set temperature of water in the boiler. The setpoint temperature is adjusted using the buttons 2. After a short press of "+" or "-" the digital indicator 1 starts showing the setpoint temperature of the boiler water. In order to change it, the appropriate button must be pressed: "+" for increasing and "-" for decreasing the temperature. After several seconds after the last press of a button, the setpoint temperature is saved and the indicator returns to showing the measured temperature of the boiler water.

When it indicates the setpoint temperature, a dot lights up beside the readout. When the indicator indicates the real measured

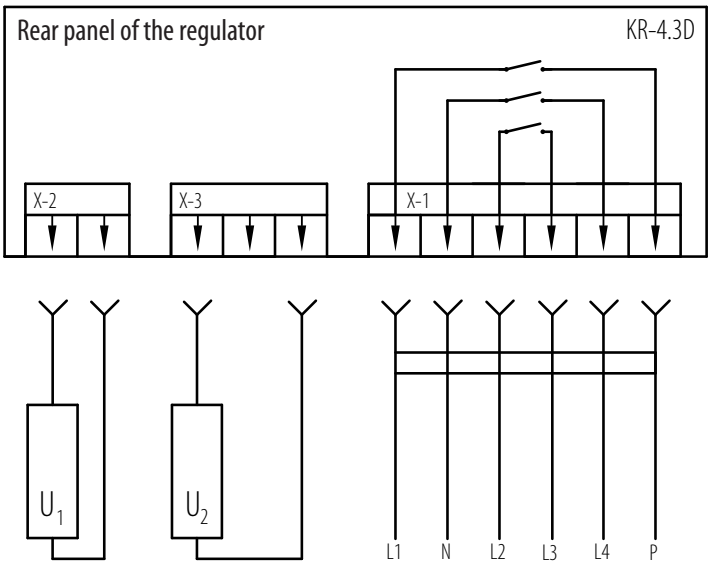


Fig. 12 Regulator connection diagram

L1, N – power supply to the regulator; L2- power supply from front control panel to the ventilator; L3 – voltage to the ventilator; L4 – voltage to the pump; P – voltage to the programmable channel; U – boiler water temperature sensor.

temperature, the dot does not appear. The regulator allows adjustment of the temperature within the range of 65-85°C.

Lamp 3 "Firing on" indicates the active status of the boiler. This lamp lights up when the ventilator is switched on using the button 3 (Fig. 9) on the front control panel and regulation of the ventilator speed starts. The ventilator can be in operation mode only when the signal lamp 3 (Fig. 11) lights.

Lamp 4 lights up when the boiler turns to the mode "Firing off". This boiler operation mode is established if the following condition occurs:

• if during operation the temperature of flue gases drops bellow 75°C and does not rise for some time.

Lamp 5 "Pump on" lights up when the regulator switches on the circulation pump of the system. In accordance with the manufacturer's settings, this occurs when the boiler water temperature exceeds 60°C. The pump is switched off, when the firing in the boiler nears the end and the temperature of the flue gases drops below 75° C. Then, pump indicator lamp 5 switches off as well. Service programming mode can be used to adjust other limit temperatures for switching the circulation pump on (in the range of 55-73°C) and off (in whatever temperature range). To carry out such adjustment, a servicing company should be contacted.

Lamp 6 "Ventilator on" lights up when the boiler ventilator is operating. The more frequently it blinks, the higher the rotational speed of the ventilator is, since its blinking frequency corresponds to the impulse frequency of the power supply to the ventilator. If this lamp is lighting constantly, it means that the ventilator is operating at 100% of its capacity.

Lamp 7 signals that the programming output channel is switched on. Button 8 is used for service programming and can only be used by the specialists of the service company. We do not recommend the user to modify the programming modes.

Button 8 is multipurpose, and is used for some support functions and service programming.

The boiler regulator is connected to the boiler circuit in accordance with the scheme shown in Fig. 12. The power supply L2, stemming from the front control panel and transferred to the regulator, is switched on when switches 2 and 3 (Fig. 9) are in the position ON and the emergency thermostat has not tripped. The impulse commutator regulating the ventilator connects periodically L2 to L3. When the boiler switches to status "Firing off", L3 does not supply power to the ventilator and lamp 4 (Fig. 11) lights up. To return to the mode "Firing on", the power supply L2 should be interrupted by switching off the ventilator switch 3 (Fig. 9) or the power supply of the boiler (on/off button 2, Fig. 9), and later turning them on. The pump control relay connects L4 to L1. The programmable channel relay connects P to L1.

The power of the operating ventilator ranges between 20÷100 VA. The maximum allowed power of the circulation pump connected to the regulator is 250 VA. The maximum allowed power of the programmable channel is 250 VA.

• PREPARATION FOR FIRING

Before kindling the boiler, check the position of the ceramic chopper 2 in the lower combustion chamber: the edge of the chopper must be in contact with the rear wall of the boiler (Fig. 2). Place two ceramic segments 3 (Fig. 2) on the chopper so that they contact the walls of the boiler chamber.

Fill the heating system with water. The filling pressure should be 0.2 bar bigger than the hydrostatic pressure, yet it must not exceed the operating pressure of the boiler. After filling the system with water, perform a visual check of the tightness of the entire system. Perform it before kindling the boiler, then again after kindling and reaching the nominal operating mode. Check if the heating system is properly deaerated.

• KINDLING PROCEDURE OF THE BOILER

Before kindling the boiler, check whether all requirements indicated in the section 1 are executed.

Open the damper of the upper flue 19 by pulling the handle 3 (Fig. 1) towards yourself. Open the door of the upper combustion chamber, put dry smaller kindling wood pieces and paper on the ceramic bottom so that the paper protrudes into the lower combustion chamber through the rectangular opening of the ceramic burner 1 (Fig. 2) – this way, it will be easy to kindle the boiler through the lower combustion chamber. Put some of the easily flammable materials and larger pieces of kindling wood and firewood atop. Load the wood without any large gaps at the top of combustion chamber. Bigger pieces of firewood should be loaded in the middle and smaller prices at the sides, because the walls of the combustion chamber slow down the combustion of the bigger pieces of wood, due to their lower temperature.

⚠ Do not cover the entire opening of the upper flue 19 (Fig. 1) with the wood, because it will make kindling more difficult.

⚠ The first time, kindle the boiler using only paper and small pieces of wood in order to safely remove the moisture remaining in the ceramic elements.

Switch on the voltage, using button 2 on the front control panel. The boiler water temperature indicator will light up on the electronic regulator (Fig. 9). Set the required outflowing boiler water temperature using the temperature setting buttons; we recommend a temperature of at least 75°C or – even better – a higher temperature. Close the door of the upper combustion chamber, open the lower door and set the kindling material on fire. Observe the rising water temperature in the regulator display. Keep the lower door open until the boiler water will heat up to 40°C. Then close the lower door, close the damper 19 of the upper flue by pushing its handle 3 (Fig. 1). Then switch on the ventilator switch 3 on the control panel (Fig. 9). After that, the boiler will operate in automatic mode: it will try to reach and maintain the setpoint temperature of the water outflowing from the boiler.

When firing the boiler for the first time, the condensation of the residual moisture and drainage of water in the lower combustion chamber occurs. This is not a shortcoming. After kindling the boiler several times, this phenomenon disappears.

⚠ The doors of the boiler combustion chambers should be tightly closed, there should be no flue gases seeping into the ambience through them. Door tightness is regulated by screwing or unscrewing the hinge and lock screws of the door.

• FIRE BED AND TIPS FOR EFFECTIVE BOILER STOKING

The hot embers and charcoal in the boiler are called the fire bed. Combustible gases emerge from there and are further burned in the lower chamber of the boiler. The optimal fire bed height during boiler operation is approximately 4-5 cm above the bottom of the fuel chamber. The output of the boiler ventilator is deliberately chosen with the purpose of sufficiently supplying the fire bed with air. Then, the most effective combustion of wood gases takes place. Avoid a situation when the volume of the fire bed expands several times. This situation can occur if very dry and thinly cut wood gets loaded into the fuel chamber. Consequently, the volume of the fire bed increases rapidly during the burning process and soon a lack of air occurs, allowing the combustible gases to escape unburned through the chimney into the atmosphere. An indicator of this undesirable course is dense fumes emerging from the chimney.

The best way to stoke a boiler is the so-called two stages method. During the first stage, the boiler is stoked with a small amount of fuel. The aim of this phase is to warm up the boiler and form the optimal fire bed. The second stage is intended for full fuel loading and to perform the main combustion.

The first stage: Prepare thin-cut wood and paper for an easy start. The volume of loaded fuel should be about 15-20 % of the

fuel chamber's capacity. Open the upper flue damper 3 (Fig.1) and both boiler doors, put the wood and paper inside. Kindle the paper, make sure that the firing starts and close the upper door. After the temperature of water in the boiler reaches 45° C, close the damper and the lower door and turn on the ventilator. Let the boiler burn further for 30 minutes.

The second stage: Load the boiler fully. If wood briquettes are used for stoking, load approx. 70 % of the fuel chamber's capacity. Before opening the door, simultaneously press the "+" and "-"controller knobs, shown in Fig. 11. The letter "L" will appear on the display and the ventilator will stop. Open the damper 3 (Fig. 1) by pulling the handle towards yourself, and after some time, open the upper boiler door very slowly to avoid smoke escaping into the room. Load the fuel, close the door and push the handle of the damper 3 (Fig. 1). Press the knob "P" on the controller panel. The ventilator will start and the boiler will continue its firing mode.

If you lack time to stoke the boiler in the two stages mode as described above, then stoke it by one stage. The boiler will operate as usual. But if there is the possibility to do so, use the two stages mode in order to achieve an even more effective combustion.

• REGULATION OF THE BOILER TEMPERATURE

See the technical description of the electronic regulator KR-4.3D.

• ADDITION OF FUEL

It is important to stop the ongoing program of a controller when adding fuel into an operating boiler (see the recommendations below)!

When the boiler is still active, the controller lamp 3 "Firing on" (Fig. 11) light is on. To add more firewood, perform the following procedure:

1. Press the controller knobs "+" and "-" simultaneously. The symbol "L" will appear on the display, indicating the program has been paused. The ventilator will automatically stop.
2. After the firewood has been added, resume the controller program operation by pressing "P" knob. The symbol "L" must disappear from the display. The ventilator will automatically turn on and continue its operation from the point of interruption.

While adding firewood into the combustion chamber after a fuel load has burned off, perform a usual procedure:

1. Open the damper of the upper flue 19 by pulling the handle 3 towards yourself (Fig. 1).
2. Switch off the ventilator switch 3 (Fig. 9).
3. Wait at least 20 seconds, allowing the smoke to be removed by draught; then slowly open the upper door.
4. Put the firewood in and close the door tightly.
5. Switch on the ventilator.
6. Close the damper of the upper flue.

If operated following this order, smoke and carbon monoxide will not enter the room. Water temperature and pressure in the system are checked by readings of the thermometer-manometer, installed in the heating system.

• COMBUSTION CONTROL

The status of the boiler firing process can be perceived from the regulator lamps "Firing on" or "Firing off" (see description of the regulators KR-4.3, Fig. 11). The flame in the boiler can be checked by opening the door of the lower combustion chamber when the ventilator is on. The visible tongue of flame has to be yellow or yellow-red and reach the ceramic element; this means the firing is proceeding in an optimal manner.

Do not keep the lower door of the boiler open for extended periods of time during firing: the lower chamber contains gases which, when escaping into the boiler room in larger amounts, can impair human health.

• DESCRIPTION OF THE SMOKE TEMPERATURE SENSOR FUNCTION

The smoke temperature sensor is mounted in Astra boilers in order to: 1) help the controller achieve the optimal smoke temperature, 2) turn off the ventilator after firing in the boiler is accomplished, 3) turn off the circulation pump after the firing in the boiler is over.

Although the optimal smoke temperature is set up in the factory, we recommend that you set the temperature by yourself once again after the installation of the boiler at its operation place. In this way, a more precise temperature will be set up with respect to the fuel used, draught and other peculiarities of the installation. For that purpose, the boiler must be brought up to an optimal and stable operation mode, and the smoke temperature at this time must be determined and fixed. First, set the water temperature on the boiler controller; we recommend 85° C, or at least 75° C. This temperature should be the one you will use to set in the future boiler operation. Kindle the boiler using the two stages method described in the chapter "Fire bed and tips for effective boiler stoking". Verify the state of combustion by opening the lower door after 45-60 minutes from the beginning of firing. At that moment, the flame tongue must be reaching the lower ceramic element, and the colour of the tongue must be yellow-red. Then check the actual smoke temperature by pressing the controller knobs "P" and "+" simultaneously. As a result, the screen should display a two-digit number representing the actual smoke temperature. The number must be multiplied by 10 to determine the actual temperature. For example, if the number 16 is displayed, that means that the actual measured smoke temperature is 160° C. The number will stay lit for 3 seconds. During this period, the controller knob "P" must be pressed again. The number on the display will blink and will then stay lit permanently for a short moment; after 3 next seconds, the controller will automatically leave the programming mode and return to its usual operation mode. Now the new optimal smoke temperature has been set up.

In a usual boiler operation, after the firing has been completed, the smoke temperature sensor will help to turn off the ventilator of the boiler and the circulation pump. When the temperature of the flue gases drops bellow 75° C, the rotational speed of the ventilator is minimized and after some more time, the ventilator and circulation pump are turned off.

If you think that that the smoke temperature sensor is unnecessary for your boiler, you can easily shut it off. For that purpose, take off the rooftop panel of the boiler (Fig.7) and unplug the sensor from the controller's X3 socket. The boiler controller will automatically switch to operate by another programme controlling the boiler without the smoke temperature sensor.

• CLEANING THE BOILER

Ashes are removed from the boiler every 4-7 days. Open the door of the upper combustion chamber and shovel ashes down to the lower chamber. Open the door of the lower chamber, take out only ceramic segments 3 (Fig. 2), pour ashes to a metal box. It is not necessary to take out the triangle ceramic chopper 2 (Fig. 2) at the time of cleaning, ashes underneath it may be raked using scraper.

⚠ In any case, strictly follow the established procedure when opening the upper door: open the damper of the upper flue, then after 20 seconds, open the boiler door.

Clean boiler chambers from tar, pitch and scurf once or twice a month. Clean the boiler when the fuel has been completely burned and the boiler is cooled down to at least +40°C.

Open the upper cap 15 for cleaning the flue (Fig. 1). Remove the turbulence plates from the flue by hooking them and pulling them out with the poker, then clean them using a scraper. Clean tar and scurf from combustion chambers and flue walls using a scraper and metal hog. Clean with the doors of the combustion chambers open. The soot residues falling down from the flue walls during the cleaning process are raked out of the boiler through the lower opening of the combustion chamber 25 (Fig. 1), pulling them outwards. When finished, place the turbulence plates back and close the cleaning cap.

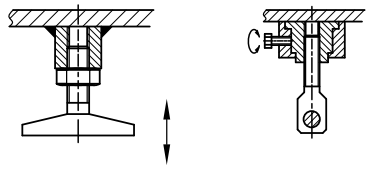
⚠ Control water pressure in the heating system at least once every two weeks. If the pressure drops, raise it by filling up the system with more water. If the boiler is not being heated for a longer time, drain the water out of the system when air temperature is below 0°C!

• EMERGENCY SHUT DOWN OF THE BOILER

If for some reason you must immediately shut down the operating boiler, by any means do not pour water on the kindling wood! The boiler can burst!

It is very convenient to use dry sand for emergency extinction. There should be ~50kg of dry sand in the boiler room. Sand not only isolates burning firewood well from the air oxygen but also cools down the burning zone. Then, when the boiler cools down, sand can be easily cleaned and removed.

8. POSSIBLE FAULTS

Fault	Cause	Problem solution
1. The set temperature cannot be reached	Not enough water in the heating system	Fill up
	Too low temperature of the return water	Raise the return water temperature
	Thermoregulator or ventilator is defective	Repair or replace
	Poor quality fuel: high moisture content, too large pieces of firewood	Use dry fuel, split firewood
	Heating surfaces of the boiler are very dirty	Clean
	No draught in the chimney due to accumulated impurities	Clean
	The ceramic burner is congested	Clean
	Ventilator damper is stuck	Move or clean
2. Smoke escapes through the boiler door	The door-sealing rope is damaged	Replace with a new one
	Door is not tight along the entire perimeter	Adjust hinge supports and door lock (regulated screwing or unscrewing of door hinge or lock screws) (see Fig. 13)  Fig. 13 Adjustment of the door and lock mechanism
	No draught in the chimney due to accumulated impurities	Clean
3. Ventilator is not operating	Emergency thermostat has tripped, light of the ventilator switch is off	Unsrew the thermostat 1 (Fig. 10) cover and press the button under it. It is absolutely required to define and remove the causes of tripping of this thermostat in order to avoid hazards to property and human health!
	Electronic regulator KR-4.3 or ventilator is faulty	Replace
	Power supply failure	Check electric fuses of the electric panel of the building; call electrician
	Lamp 4 lights up (Fig. 11, see technical description of regulator KR- 4.3)	All firewood has burned. Load more firewood, kindle the boiler

9. WARRANTY AND ITS VALIDITY TERMS

The manufacturer provides a warranty for the boilers, the main conditions of which are the following:

- the connection of the boiler to the heating system as well as the initial kindling, adjustment and repairs are carried out by an authorised company;

- the boiler is connected to the heating system and operated following the requirements of this operation manual;
- the duration of the warranty period for the boiler is the following:
  - for the heat exchanger of the boiler against leaking – 60 months,
  - for other parts of the boiler – 24 months.
- the warranty repairs are performed when the fault has occurred due to the manufacturer's fault;
- the warranty term is not extended after removing the faults which have occurred during the warranty period;
- boiler cleaning and heating system adjustment works are not covered by the warranty;
- the damage caused to the premises and the property in the premises due to the boiler fault will not be compensated;
- the warranty repair works and replacement of parts during the warranty period are free;
- the warranty period starts from the boiler purchase date;
- the warranty is valid only if the boiler is installed, connected to the heating system and operated following the requirements of this manual.

The warranty does not apply in the following cases:

- in case the heat exchanger is limed;
- in case the water or other liquid inside the boiler has been frozen;
- in case of fault of the boiler due to improper operation;
- in case of fault of the boiler due to improper connection to power supply;
- in case the boiler parts are mechanically damaged;
- in case the boiler is connected to the heating system not in accordance with the diagrams and requirements of the operation manual.

The post-warranty repair works will be carried out at the expense of the owner of the boiler.

⚠ The buyer must follow all the requirements of this operation manual during transportation, storage and operation, otherwise the manufacturer warranty does not apply.

10. ACCEPTANCE CERTIFICATE

The heating boiler **Astra G-** ....., serial No. ....,, conforms to the technical documentation and requirements of standard EN 303-5 and is approved as fit for operation.

Manufacturing date 201 .....

L. S.

Head of Quality Service .....

SELLING CARD

Boiler sold by:

Company: .....

Address: .....

Telephone:.....

Date of sale: .....

Signature: .....

BOILER INSTALLATION PROTOCOL

Boiler was installed by:

Company (technician): .....

Address: .....

Telephone:.....

Installation date:.....

Installation data:

Height of the chimney: .....

Diameter of the flue: .....

Draught of the chimney: .....

Other information concerning installation: .....

.....

.....

The boiler was tested on site, the control and safety elements were checked and found to be operating properly.

Person responsible for installation and testing: .....

(Name, surname, signature of the employee)

I accept the installation works: .....

(Name, surname, signature of the client)

WARRANTY AND POST-WARRANTY REPAIR CARD

Boiler repaired by:

Company (technician): .....

Address: .....

Telephone: .....

Repair date: .....

Information on fault, works performed:.....

.....

.....

Signature of the technician: .....

Boiler repaired by:

Company (technician): .....

Address: .....

Telephone: .....

Repair date: .....

Information on fault, works performed:.....

.....

.....

Signature of the technician: .....

DECLARATION OF CONFORMITY

CE

LT

Manufacturer: Machinery plant “Astra” AB

Address: Ulonu g. 33, 62161 Alytus, Lithuania

Product designation: heating boilers Astra G-18E, Astra G-25E, Astra G-32E, Astra G-40E

We declare that the above-mentioned products conform to the requirements of directives 97/23/EEC Article 2.3 and 2006/95 EEC.

The following standards were applied for the above-mentioned products:

LST EN 303-5
LST EN 12828
LST EN 60335-1
LST EN 60529

Procedure of conformity evaluation in accordance with Article 2.3 of 97/23/EEC was performed by “Inspecta”, www.inspecta.com. Certification No. 2-4.2.1/619/2012

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(date)

Gražvydas Eimanavičius, project manager